

Final

These notes are in the following order:

1. Attendance
2. Correspondence and Handouts
3. Administrative Items
4. Proposed Remedial Action Plan for UST's, BLIP, and g-2 Tritium Source Area and Plume;
Doug Paquette, Environmental & Waste Management Services Division
5. Community Comment
6. Nanoscience at the Laboratory, Doon Gibbs, Associate Director for Basic Energy Sciences
7. Nanosafety at Brookhaven National Laboratory, Steve Hoey, Environmental Safety & Health
Coordinator for the Center for Functional Nanomaterials
8. Agenda Setting

1. Attendance

Members/Alternates Present:

See Attached Sheets.

Others Present:

S. Aronson, M. Bebon, P. Bond, A. Carsten, J. Carter, B. Casey, H. Carrano, J. D'Ascoli, B. Dorsch, K. Geiger, D. Gibbs, T. Green, G. Goode, S. Hoey, M. Holland, B. Howe, M. Lynch, D. Paquette, S. Penn, G. Penny, A. Rapiejko, S. Robbins, R. Schandel, A. Sprintzen, J. Taylor

2. Correspondence and Handouts

Items one and two were mailed with a cover letter dated October 6, 2006. Items three through five were provided in the member's folders. Items six, seven and eight were available as handouts distributed at the meeting.

1. Draft agenda for October 12, 2006
2. Draft notes for September 14, 2006
3. Copy of presentation on Proposed Remedial Action Plan for USTs, BLIP, and g-2 Tritium Source Area and Plume
4. Copy of presentation Nanoscience at Brookhaven National Laboratory
5. Copy of presentation Nanosafety at Brookhaven National Laboratory
6. Copy of Proposed Remedial Action Plan for USTs, BLIP and g-2 Tritium Source Area and Plume (PRAP)
7. Copy of Standards Based Management System (SBMS) Interim Procedure "Approach to Nanomaterial ESH"
8. 2005 Site Environmental Report

3. Administrative

The meeting began at 6:38 p.m. Those present introduced themselves. Reed Hodgkin reviewed the ground rules and the draft agenda.

Reed asked for corrections, additions or deletions to the September 14, 2006 Notes and Action Items. There were no corrections, additions or deletions. The notes were approved, with no objections and one abstention.

Reed introduced Jeanne D'Ascoli. Jeanne announced the findings of the Environmental Assessment (EA) for the NSLS II. The Department of Energy (DOE) concluded the review with a Finding of No Significant Impact (FONSI). Newspaper advertisements will be run on October 25 to notify the public about the public comment period. The EA and the FONSI will be available at local libraries and can be accessed through the NSLS II website.

Jeanne also spoke about an e-mail communication sent to the CAC related to cyber-security. As a result of the communication it became apparent that e-mail information for all CAC members might not be current. Jeanne apologized for any resulting lack of communication and asked that members take a minute to e-mail current contact information to Sherry so that she can update the addresses.

Mike Bebon, Deputy Director for Operations, spoke to the CAC about the Cyber-Security stand down on October 5, 2006. The Laboratory disconnected from the Internet for a day to conduct update activities on desk computers and systems work. Employees participated in cyber-security and Personally Identifiable Information (PII) training sessions. Procedures dealing with password configurations were improved. Other areas of attention identified to cyber-security and overall security identified will be addressed in the coming weeks.

Member Esposito asked if something prompted this action. Bebon replied there was a DOE team that was invited to take a look at cyber-security at the Lab. They had alerted the Lab to items that needed to be addressed and the Lab took action.

Les Hill gave the CAC a brief HFBR update. On September 9, 2006 a failed seal in an air conditioning pump caused a leak of 26,000 gallons of clean water into the confinement building. The water collected in the spent fuel canal and one of two elevator pits. Once it entered those areas, it became tritium contaminated at or below drinking level standards. Previously work was done in the spent fuel pool and elevator pits when the building was renovated to Suffolk County Sanitary Code, Article 12 standards. It was modified and qualified to serve as a secondary containment building. Water levels are being monitored in both locations and there have been no changes in elevations. The sanitary discharge is also being monitored and there have been no findings of any water exiting the building. All the water will be pumped out by next week and transferred to the Waste Management Facility. It will be processed and solidified on-site and disposed of as low level Rad waste. Tritium levels are at or below the drinking water standard and present no risk to anyone on-site. There will be an investigation done to determine why this happened to assure it does not happen again.

Member Giacomaro asked if this event happened on a weekend, if the building was unoccupied, if there were any alarms in the spent fuel pool area, and why the air conditioning was on.

Hill responded that it had not happened on a weekend. An engineer had found it at 2:00 on October 19. He noticed the water flow to the cooling tower had ceased. The engineer made sure nothing was exiting the building and took samples of the water. Hill said the building was unoccupied and that there were no alarms in the low points of the building. One facet of the investigation will be to look at the alarms in connection with the air conditioning for the building. Hill said the air conditioning was on because the building is accessed for routine housekeeping: removal of excess materials and work is done in the building on a routine basis. Additionally the air conditioning unit serves areas outside the confinement building itself.

Member Garber asked if all the leakage went into the inner part of the double wall container or had any seeped into the old part and if the water on the floor could flow under the wall into the inner part.

Hill said there is no evidence that any water had gotten past the inner liner. He said that monitoring began right after the event and there has been no decrease in water level seen.

Member Heil asked for an explanation of the solidification process.

Hill said RADLOCK was one of many products used for the process. George Goode explained the material was much like the polymer type material used in a baby diaper that will absorb many times its weight in water.

Member Esposito commented that it was good the money had been spent to upgrade the spent fuel pool.

Member Jordan Sweet asked why the contamination needed to be handled as waste if the tritium was at or below the drinking standard and what the disposal would cost.

Hill said it would not be responsible to discharge the waste into the environment. The decision not to discharge aligned with the values of the project team. Hill said the entire recovery, including the disposal effort, would cost approximately \$300,000.

Member Giacomaro asked if a failed seal caused the water to pump at 40 gallons per minute. He commented it was almost as if there was no seal and asked if there were other similar pumps to the one that failed.

Hill said it was a large, catastrophic leak and there would be continued inspections of extended conditions. He said the system will not be started up and there were no other pumps of that kind.

Member Esposito thanked Hill for deciding not to discharge the water to the environment.

Hill updated the CAC on the progress of the HFBR. He said they were working with the regulators and responding to comments that had been received. The document will be resubmitted to the DOE and the regulators. Some of the changes made were in response to the comments made by the CAC. Hill believes discussion on the HFBR will resume sometime after January 1, 2007.

Reed asked the CAC if they would like to hear back from Hill on the resolution of the water event at the HFBR. The CAC would like to be updated.

George Goode announced that the Site Environmental Report for 2005 had been published and was available to the group. The report is a key reference for environmental activity at the Laboratory. It is available on the web in PDF format. A summary book and CD will be available in two weeks (copies were available at the meeting).

Member Kaplan asked if there would be actual access to data in the PDF form.

Doug Paquette replied the PDF contains a summary of the data.

Goode mentioned that this release is one of two volumes. Volume 2 will contain the annual Groundwater Status Report, which chronicles groundwater-monitoring results, including the all the tritium activities currently being conducted.

Tim Green, Natural and Cultural Resources Manager told the CAC the Laboratory would host the 9th Annual New York Wildfire and Incident Command Academy from October 20 through October 30, 2006. He said a prescribed fire might take place sometime between October 22nd and October 27th. A fifteen-acre parcel in the northeast corner will be divided in half and used for this purpose. Parameters and checklists will be followed prior to the fire. If all is to proceed two telephone calls will be made, one to Mike Bebon and the other to Mike Holland. If approvals to proceed are attained from both individuals, the action will be initiated. If anything happens

outside of the prescription, the fires will be shut down and postponed until new prescriptions are attained.

Member Jordan Sweet spoke about the NSLS tour she conducted for the CAC prior to the meeting. Eight people attended and spent 25 minutes in the lobby discussing aspects of the NSLS before touring the experimental floor. Andrew Ackerman, a safety officer for NSLS joined the group. The group was escorted around the floor and viewed protein crystallography and material science beam lines.

Reed and the CAC thanked Member Jordan Sweet for her effort and time.

4. Proposed Remedial Action Plan for USTs, BLIP, and g-2 Tritium Source Area and Plume, Doug Paquette

Doug Paquette gave a presentation on the Proposed Remedial Action Plan as a follow up to last month's overview of the Focused Feasibility Study. The CAC was encouraged to ask questions and begin discussion to develop a recommendation to the Laboratory. Paquette began with a review of the projects included in the remediation. He said the projects - the Former Underground Storage Tanks (USTs), Brookhaven Linac Isotope Producer (BLIP) and the g-2 Tritium Source Area and Plume, have received preliminary concurrence from the DOE.

Member Esposito asked if concurrence was received for all three projects and Paquette said yes.

Paquette explained the USTs were removed in compliance with the Suffolk County Department of Health Services (SCDHS). They pose no further environmental concerns and no additional actions are required.

The BLIP facility began operations in 1972. It is still in use, producing medical isotopes used around the world. Remediation issues include activated soils not fully protected from rainwater infiltration, tritium in the groundwater exceeding 20,000 pCi/L, and localized groundwater impact. Corrective actions were taken and groundwater-monitoring wells were put in place. The tritium levels are now less than 20,000 pCi/L. The proposed remediation plan for BLIP is to continue source control and monitoring. The data will be reported in the annual Groundwater Status Report and the CERCLA 5-Year Reviews.

Member Esposito asked for clarification of the year the tritium was discovered at BLIP. Paquette said 1998.

The g-2 Particle experiment ran from June 1997 through April 2001. Environmental issues include activated soil and tritium in groundwater at concentrations exceeding the 20,000 pCi/L. Corrective actions taken included the refocusing of the experiment's particle beam to make it smaller and minimize soil activation, installation of a concrete cap over the soil for protection, and installation of new monitoring wells to verify the effectiveness of actions. The plume is located in the central portion of the BNL site. Tritium concentrations in the wells that are next to the source are currently less than 60,000 pCi/L. The plume is attenuating by natural decay and dispersion and tritium levels are expected to be at or below drinking water standards by 2010 to 2015.

Member Esposito: In the spot where the level was 3.4 million pCi/L, down gradient or at that spot, the highest level you found now is 60,000 pCi/L?

Paquette: Yes, the as of the last sample. Over the last two years the concentrations in those wells have shown below 100,000 pCi/L, which is slowly declining. That sample was from July.

Member Esposito: Right now, the highest maximum level that you found is 60,000 pCi/L?

Paquette: No, only in the wells next to the source. In the rest of the plume down gradient, the concentrations are higher.

After a brief review of the five alternatives, Paquette told the CAC the preferred alternative for g-2 is Alternative 2, Continued Source Control and Groundwater Monitoring with Contingency Actions.

Paquette said the public comment period had begun and would run through November 13, 2006. A Poster Session will be held on October 18 and a Public Meeting will take place on October 25, 2006. The Record of Decision (ROD) and Responsiveness Summary will be prepared and the ROD will be finalized in Spring 2007.

Member Esposito: What is the difference between a Poster Session and a Public Meeting?

Paquette: The Poster Session is an informal information session. The Public Meeting is an opportunity for formal public input that is recorded by a court stenographer.

Copies of the Proposed Remedial Action Plan were distributed to each CAC member.

Member Kaplan: Did you say there is a higher concentration (of tritium) down gradient to the plume?

Paquette: Before the cap was put on, there was a slug release of tritium into the aquifer. That slug continues to move down gradient. It is attenuating as it moves but its concentrations are over 100,000 pCi/L. After the cap was installed, there were still several periods when tritium bled out of the vadose zone. There appears to be a correlation between those slug releases and the rise in the water table. The residual tritium that was closer to the water table is being flushed out. There are three slugs with higher concentrations.

Member Kaplan: Can you tell us approximately how far down gradient they are?

Paquette: There are three areas that correlate to the slug releases in the source area. The Feasibility Study and the Administrative Record contain detailed maps of those areas.

Member Kaplan: Could I get an enlarged copy of that map?

Jeanne D'Ascoli: We can provide that to everyone.

ACTION ITEM: Provide large color map. (The CAC was notified that a color map was included in the PRAP.)

Member Guthy: Where are the Public Sessions being held?

Paquette: The information sessions will be held at the Lab, at Berkner Hall in Room D.

D'Ascoli: The details of the meetings are on the front page of the PRAP.

Member Shea: I would like to have a full size copy of all the maps, all three of them. Is that possible?

Paquette: Yes. We can get that for you.

Member Shea: As referenced in Alternative 3, where is the strontium-90 and what levels are there?

Paquette: There is a facility called the Waste Concentration Facility and there's a strontium-90 plume that sits near that. If we were pumping the tritium plume, there would be a high likelihood especially with the high flow pumping, that we would pull some of that strontium-90 into the water.

Member Shea: But that's not part of this clean up?

Paquette: It's a separate issue.

Member Shea: What is the drinking water standard for strontium-90?

Paquette: Eight pCi/L.

Member Esposito: I am a little disappointed there weren't more data points provided that would better characterize the plume. What are the concentrations at the highest levels, where are they and what is their depth?

Paquette: We've done a lot of characterization in the Alternating Gradient Synchrotron (AGS) parking area. We put a lot of temporary wells in there....

Member Esposito: How far is that from the original source?

Paquette: About 900 feet. In the AGS parking area the tritium plume is about 20 to 25 feet.

Member Esposito: How far below the surface is that?

Paquette: About 55' to 60' below the surface. The strontium-90 plume below that area is closer to the water table. We were very successful in characterizing the AGS parking area and we saw concentrations that did not exceed 500,000 pCi/L. Last year we pumped more water than usual, which caused the plume to shift 50 feet. This made it difficult to characterize. Controls were implemented and as a result the Water and Sanitary Planning Committee was formed. The details are in the Focused Feasibility Study.

Member Garber: The focus has been on the monitoring wells just off the cap apron but down at the aquifer level. If the cap is compromised and water is getting in there, how long does it take before this intrusion will show up at the monitoring well? I'm wondering if an inexpensive addition would be to have some sort of plain water detector underneath the cap so there is warning time before the water purges out more tritium on its way down.

Paquette: That is a very good idea. We have had discussions with engineers about putting probes in the area underneath that cap to check for soil activation over time. Once the tritium enters the soil, it takes about a year before it gets into the groundwater. The groundwater moves with the pressure of its own flow and then can be sampled at the wells.

Member Graves: Is the information learned about focusing the beams and the soil activations shared with other facilities? Are you sharing problems and solutions?

Paquette: We spend a lot of time with other facilities within the DOE complex. Prior to discovering the problem we estimate we were losing five percent of the beam that was hitting the magnet and spreading particles to the soil creating activation. Once the beam was refocused we were able to reduce that loss to .5 percent.

Member Esposito: Was there any consideration given to adding remediation in the hot spots to Alternative 2?

Paquette: Alternatives 3, 4 and 5 include everything we would do in Alternative 2. If hot spot or high flow pumping were implemented, the actions in Alternative 2 would be included.

Member Kaplan: You are using the concept of a plume, which I understand as a continuous discharge, and slug, which I associate with apuff. Can you explain how there can be both a plume and the slugs?

Paquette: As we looked at the concentrations in the monitoring wells over time, we saw spike increases that were associated with the first release. After the cap was installed there were several other spikes of concentrations. This indicated that zones of higher concentrations in the groundwater passed by that monitoring well. The concentrations would increase for one or two sample periods and then decrease to lower concentrations. The monitoring wells next to the source continued to read concentrations above the 20,000 pCi/L standard.

Member Kaplan: Did g-2 operate continuously?

Paquette: It did not run continuously, however the releases are not tied to run periods. They are related to rainwater events and a build up of radioactivity in the soils. Our best estimate is that the releases are associated with the water table rises in the vadose zone that contains residual tritium.

There were no more questions. The PRAP was distributed to the CAC members. Reed asked the CAC how they would like to proceed. Member Conklin suggested the group read the PRAP and reconvene at the next meeting. Member Garber suggested a non-binding poll of the group. The CAC agreed to an informal poll.

A poll was conducted with the following results:

Member Henagan: I'm good with Alternative 2. No statement now.

Member Guthy: Same. I'm good with Alternative 2 and since they have the contingency actions if there are any problems after that; I'd be comfortable.

Member Esposito: Undecided. I would like to read the PRAP.

Member Elayeva: Same.

Member Garber: No comment now, I'd like to read the PRAP.

Member Heil: At this time I support Alternative 2.

Member Kaplan: I would say the same thing except that I have to see the map.

Member Peskin: My first impression is that Alternative 2 is right but I would like to come back to this after I've read the PRAP.

Member Biss: No comment.

Member Sprintzen: Pass.

Member Garber: I am comfortable with Alternative 2, but certainly I will read the PRAP. I'd like to see if additional liquid monitoring under the cap could be managed.

Member Proios: Same. I would also like to see additional monitoring because the additional wells onsite could shift things, a lot of rain could also shift things. If these pools or slugs are

directional, I think having additional monitoring is just some extra insurance that you could attach to it when it's done.

Member Giacomaro: I'm comfortable with Alternative 2.

Member Jordan Sweet: I agree with Don and George.

Member Shea: I need a little more time; I'd like to read the PRAP. I need clarification on what constitutes the contingencies.

Paquette explained the contingencies are described in PRAP. Reed added that Member Shea could ask for more detail if she does not find the information she seeks in the PRAP.

Member Conklin: I second Jean's statement. The one little concern I have on this is the strontium-90 plume that might be attempted in one of the other alternatives and whether it is worth it to push it to get to that point. I will read the PRAP.

Member Graves: I would like to read the PRAP.

Reed said a g-2 discussion would be put on the agenda for the next meeting.

5. Community Comment

No public comment was made.

6. Nanoscience at the Laboratory, Doon Gibbs

Doon Gibbs, Associate Director for Basic Energy Sciences, gave the CAC a list of upcoming presentations related to nano and informed them that Emilio Mendez, of Stony Brook University, had been named as the new Director of the Center for Functional Nanomaterials (CFN). He will assume the position November 1.

Gibbs reviewed the nano-scale and general nanoscience terms. He explained that nanoscience is the understanding and control of matter at dimensions roughly 1 to 100 nanometers. Nanoparticles can be naturally occurring, created as incidental byproducts of combustion processes or intentionally engineered and produced.

Gibbs explained that nanoscience is a globally significant topic. Fourteen countries account for 90 percent of the \$5.5 billion invested in nanoscience. The United States and Japan have the most money invested. The United States' national initiatives began with the National Nanotechnology Initiative of 2000 and continue with the American Competitiveness Initiative of 2006. Gibbs noted that experiments at the nanoscale have been conducted at Brookhaven National Laboratory in the areas of molecular catalysts, properties of aerosols in clouds, mesoscopic correlations in high temperature superconductors, PET/MRI imaging and molecular ordering at surfaces.

The CFN will be one of five Department of Energy (DOE) Nanoscale Science Research Centers. The CFN will provide state-of-the-art capabilities to fabricate and study nanoscale materials to researchers and users. The CFN is scheduled for initial occupancy in April 2007 and planned for full operations in April of 2008. It will support the DOE Energy Mission exploring Nanostructured Catalysts, Electronic Nanomaterials and Bio/Soft Nanomaterials and Interfaces.

Member Proios asked if this discussion used a different definition of catalyst than normally used. He said a catalyst normally helped to initiate a reaction without becoming involved in it and it sounded as though the nanoparticles would actually become incorporated in the reaction. Gibbs

said that the nanoparticles are part of the reaction in that sense but left unchanged when the reaction is over.

Gibbs said the plan for CFN is to create a synergy between CFN, NSLS I, II and core programs working with university and industrial partners to address national scientific challenges. Currently work is being done at BNL to create nanostructured catalysts for improved hydrogen fuel cells. At other locations, nanomaterials are being used for Life Sciences research in an effort to develop targeted drug delivery. Gibbs concluded with the DOE Secretarial Policy on handling nanomaterials and took questions from the CAC.

Member Kaplan: Would you characterize the Center, without NSLS I, II, as a User Facility?

Gibbs: Yes. In fact, if you're interested you could join us right now in an experiment. The DOE initiated a jumpstart program two or three years ago, even though we didn't have a building yet. The DOE felt it would be good to know how user facilities that do nanoscience should work. Our core program scientists are hosting users so that they can work with our nanoscience equipment. We have received 150 user proposals in the last three years. We have learned a lot about the User program.

Member Kaplan: When I think of RHIC, or NSLS, they are machines. They have beam lines; it's like nowhere else. But the Center, it's a building, and that's why I ask, apart from the Light Source, just the Center itself, what is unique in terms of what's inside?

Gibbs: It is a building, but it will contain remarkable capabilities. There will be advanced electron microscopes, nano patterning devices, physicists' materials, and an ultra-fast laser set up with beam lines at the Light Source. What makes us unique is an interesting question. What we think that is, in part, is the remarkable equipment; but also the people that we have hired and are hiring to come to the building.

Member Peskin: I know that nanoscience is one of the few areas of science that New York State has taken a special interest in and has put a great deal of investment in; particularly in the Hudson Valley and the Albany Nano Tech Center. Is the CFN associating itself with those activities at all?

Gibbs: We are a part of the New York Energy Consortium. We have been working with Albany Nano Tech to find areas of common interest that we can work on together. An exciting development in the last few months is the funding New York State has provided to build a new energy center on Long Island. It is a consortium of institutions led by Stony Brook University including Keyspan, Farmingdale, CUNY and BNL as part of the effort to develop new approaches that combine basic research with applied research and getting to the marketplace in some new environment. The CFN will be a key part of that. The goal of the consortium is to get as big as Albany Nano Tech, only centered on energy. It's exciting. We have \$30 million for a building and I am looking forward to being involved.

Member Sprintzen: You mentioned the properties of gold and the different properties that occur on the nanoscale, do you know at what size those properties dissipate? Do they do it slowly over time or quickly? What is it that transforms the properties of the separate atoms or the small number of them from the properties of the regular material?

Gibbs: That is an interesting question. That is an element of our work, to try to understand just that question. If you think about a material, a lump of gold or aluminum in your hand, and you look down deep inside at a single atom, that particular atom has a lot of other atoms on top of it. If you look at an atom on the surface, that atom has a bunch of neighbors underneath and none on top. That change in bonding, the fact that there is chemical bonding just below and not above, can alter the properties of atoms at the surface. Surface Science is a field that is 20 or 30 years old. Now imagine shrinking the big lump of gold down to the nanoscale. One thing that

is happening is that the ratio of the surface area to the volume is getting larger. One idea is that as you go to the nanoscale, the fact that you have fewer neighbors for a lot of these atoms ultimately underlies the reason that their properties change.

Member Sprintzen: Could one say in generic terms that the properties are not characteristics of the atoms themselves but of the field in which they're a part of?

Gibbs: It's the collection of atoms that forms its properties, and their geometry.

Member Guthy: Thank you, Jean for taking us through today (NSLS Tour). It's amazing; I'm still trying to get over it. I just want to thank everybody; I think this is such a great facility. Such large machines viewing things smaller than you can see. I just wish everybody could have been there to see it. Thank you again, Jean.

Member Garber: Are you spending a considerable amount of money for a modern equivalent of a machine shop that would allow the experimenters to use world-class fabrication to make what they had envisioned?

Gibbs: We are building fabulous fabrication devices for materials. The Nanoscience Center itself doesn't have a traditional machine shop in it and the reason is in part that the Center is incredibly clean. The machine shop will be in the Chemistry Department. The fabrication of the nanomaterials themselves will be in the CFN but the lathes and the more traditional tools that some of experimenters may eventually need will be in the machine shop.

Member Shea: Are you going to be working on new methods for home heating and cooling with nanotechnology?

Gibbs: I think that's a real possibility. One of the major thrusts is more efficient heating and cooling for buildings. The ways that windows work and the kind of materials used for reflecting heat off walls is a major issue for the nation and for nanoscience. Whether we will be doing that here or not, I don't know, but nanoscience does have a role there.

Member Shea: Are you going to be collaborating with other countries when doing the energy research, like Japan for instance? Or are you going to be competitive?

Gibbs: Both. The nature of science is that collaboration is a really useful and wonderful approach in getting results. We will collaborate with many folks from everywhere through the User Facility as appropriate. But one of the interesting things about human nature is that good things happen when we compete. So we'll be doing both.

Member Proios: Referring to the chart showing the money being spent by countries on nanoscience, do you know what percentage of that money is set aside for environmental issues?

Steve Hoey, CFN ESH Coordinator: Four percent.

Member Proios: Is there coordination of information, like a clearinghouse, in a central location? If you change particles in a way so that insulators become conductors or insolubles become soluble or metals become explosive, is there any way of collecting that information in a central location so that the work won't have to be done again to know what you're dealing with?

Gibbs: Yes. Steve Hoey will address the development of national standards, which directly addresses your question. Brookhaven has been very proactive in this regard.

Member Graves: Fusion has always been the holy grail of energy production. I'm wondering if you've seen any proposals that tie nano with fusion.

Gibbs: If you look at the energy policy of the nation, at least as it's being developed by the DOE, one of the thrusts that is emerging for basic science is to look at the way nanomaterials behave in extreme environments like high radiation, high heat or high pressure. The reason for that is to develop a more efficient fusion reaction. There is a big effort to explore that.

Reed and the CAC thanked Gibbs for his presentation.

9. Nanosafety at Brookhaven National Laboratory, Steve Hoey

Steve Hoey presented an overview of the potential Environmental, Safety and Health (ESH) risks related to nanoscience and discussed BNL's approach and controls for the safe handling of nanomaterials. Hoey reviewed the definitions of nanoparticles. Member Giacomaro asked if pollution was considered a nanomaterial. Hoey replied there were by-products of pollution that were in the nano range.

Hoey said nanomaterials are of interest to science and industry because properties of materials in bulk will differ from those in nanoscale. The Quantum effects of nanoscale materials, such as changes in optical, electrical or magnetic properties or changes that increase surface area that make material more reactive, are aspects of attention related to safety and health. Hoey said some nanomaterials pose potential ESH concerns because toxicology is not well understood. Acute and chronic effects in the body have not been identified, exposure standards do not exist, detection methods are limited for the nano range and fate in the environment is not well understood.

The National Institute of Occupational Safety and Health (NIOSH) is a federal agency that was formed to study the effects of hazardous materials and worker exposure. NIOSH has posed questions to the ESH community on potential risks from nanomaterials concerning unique work-related health risks, body system interactions, and level and duration of effect. The agency is driving the study of appropriate methods for measuring and controlling exposures to nanoparticles. The Environmental Protection Agency (EPA) manages issues related to environmental impacts and explores the effects of mobility of nanoparticles, impact of surface chemistry nanoparticles, degradation of materials that contain nanoparticles and the mechanisms of that degradation as well as the effects of nanoparticle bioaccumulation. Hoey said BNL policy is to contain all nanomaterials during research and collect all nanomaterial or nanocontaminated material for proper disposal.

Member Proios asked what regulatory background an individual would need to examine all the areas mentioned. Hoey said all agencies are needed to support this work. Many agencies are coordinated through the National Nanomaterials Initiative, (NNI) to examine the health and safety issues related to nanosafety. Hoey said this coordination of agencies is an unprecedented initiative with respect to a new technology.

Hoey told the CAC that managing unknown risk is not new in a research and development environment. The ESH approach is to make conservative assumptions about risk, measure material and establish the most effective available controls using current best practices. The health concerns with nanomaterials are primarily focused on engineered free particulates. Current information available about how particulates behave can be used to address issues with nano particulates and establish control methodologies.

Hoey said practice suggests that in the absence of available toxicity data, exposures to nanomaterials must be minimized. Good work practices can help minimize worker exposure to nanomaterials. Efforts should focus on substitution of less dispersible materials, engineering controls, and standard chemical handling practices, use of good housekeeping, maintenance, hygiene and sanitation practices. Additionally, control techniques such as source enclosure and

ventilation systems are considered to be effective for capturing airborne nanoparticles. Personal Protective Equipment (PPE) is also used.

Member Proios asked if the equipment used in these methods were affected by nanoparticles. Hoey replied that research on the materials was ongoing. At this time, NIOSH has no recommendation related to glove use. At BNL it is recommended that gloves be changed at frequent intervals. Safety glasses and lab coats, respirators and filters that protect against gases are other PPE used.

Hoey said BNL has been involved in the Nuclear Safety Research Conference (NSRC) with the other five DOE Nanocenters since the conceptual stage of the CFN in 2002. Previously established Nanocenters share their lessons learned with the NSRC ESH Working Group.

At the Laboratory level, the Policy Council Ad-Hoc Nanosafety Working Group was chartered by the Laboratory Director to evaluate procedures related to the document and assure implementation. The ad-hoc committee recognized the need for a permanent institutional nanosafety committee. The Institutional Nanoscience Safety Advisory Committee (INSAC), is a technical committee was formed and is tasked with keeping the Lab Director informed of emerging nano issues and with providing a technical resource to research organizations. Committee members include personnel from ESH, Science, Operations, Medical and CEGPA.

Hoey concluded his presentation by describing the attributes that a Nanomaterial ESH Procedure should include and provided a list of nano ESH documents available on the web.

Member Sprintzen: You talked about ways of managing risks and science and you also spoke about the potential benefits in energy; won't there be a tremendous amount of pressure to get these products onto the market? It seems to me there is an implicit tension building between the pressure for profitability and effective results with the notion that these products are assumed dangerous until proven otherwise. Where and how does that issue get addressed and how could we have any kind of assurance given the regulatory environment for the last several years that there will be any coherent regulation of this?

Hoey: That's a great question and I wish I could answer it. That's actually one of the reasons the NNI is so important from the ESH standpoint. There is a coordinated research effort. There are agencies within the NNI, for example the Consumer Safety Product Institute, whose roles are to protect the consumer with respect to products. We in research would not have direct impact on that unless we were bringing a product to retail.

Member Sprintzen: Is there any way for the scientific community to organize to be an effective force?

Hoey: The scientific community has an obligation to provide research-based information to the agencies that develop the regulatory requirements that will be put in place. Some of the research now is looking at what we really need to know, like toxicology. There is research at this Laboratory at the cellular toxicological level. We have to go through the process to get to the point where we can sort out which materials are harmful and which are not. Hopefully, the NNI initiative will help coordinate that information at a quicker pace than we've seen in the past.

Member Peskin: Has there been any work done on the permeability of conventional materials in the presence of nanomaterials? In other words, you think you have something encapsulated and then you don't.

Hoey: I don't know of any specifically; with the exception of PPE project work. I know NIOSH has information on their website about clothing and what they expect permeability would be with that clothing. I know work is going on about gloves and what would provide the best protection to the worker. Someone asked the question earlier about the amount of research going on with

ESH. It's about four percent of the proposed NNI budget of \$45 million for FY07. A lot of that research is materials research that has ESH implications.

Member Kaplan: Thank you for a very comprehensive ESH presentation. This was something I had asked for and I really appreciate it. That being said, how much ESH related research would be done here?

Hoey: We have contemplated that question and I don't know the answer for it. There is toxicology research going on and there is talk of Land Disposal Restriction (LDR) money to be spent on it. I can't tell you the exact amount at Brookhaven but I can tell you there is interest.

Member Kaplan: What is the highest level of protection that is being built in at the Center? I'm thinking in terms of toxicology, do we have high levels of protection built into the labs there?

Hoey: The way CFN is designed, most of the controls we would use for handling nanomaterials are very similar to those that have been used for years when using and treating hazardous and toxic chemicals. The Center will have exhaust ventilation hoods in it; some of them will be HEPA filtered. Based on previous research they appear to be very effective. NIOSH has done research along these lines and we expect information from them shortly. Nano filters are very effective in the particulate range to below 300 nanometers. We have designed our facility to put HEPA filters in the areas where we expect we might do this particular work.

Member Kaplan: I'm thinking in terms of a facility where for example, you have differential pressure; that the pressure from outside the lab is greater than that inside the lab, so you keep everything inside the lab.

Hoey: When you put exhaust ventilation inside a lab you do create pressure, that's typical of all the laboratories and it's also the case that at the Nanocenter. I thought you were alluding to biosafety levels, where you get out into the 3's and 4's and people are wearing bubble suits and things like that. That's not the case here. This material is much easier to contain in a glove box. We will be using this in very small quantities; the estimated total nano inventory for the Laboratory is less than a gram.

Member Giacomaro: Do you have procedures in place to protect whistleblowers?

Hoey: Not specifically with respect to nanomaterials but we do have procedures and protocols at the Laboratory that provide whistleblower protection. There are protocols for people to call and speak to supervision, talk to ESH professionals, talk directly to the DOE or the Inspector General. They are posted throughout the facility. We have been reaching out to our working staff, making presentations and talking about nano. We are presenting what we are doing and the concerns we have. If people have concerns we can't answer they can go directly to DOE or other areas. The system is postured well with respect to that.

Member Proios: I am a confirmed cynic. What bothers me about this whole area is not so much the nanoscience itself, but the way it is evolving. It brings to mind just what we are doing here now. For the last two decades we have been dealing with legacy waste, and the two common responses we got then were that there weren't any regulations so there weren't any laws broken and no one actually thought that what was being done would turn out to be bad for the environment. There were PhDs and Nobel Prize winners and nobody anticipated what the effects would be. Lux Industries, with a major involvement in nanoscience, is saying this is mimicking the nuclear industry of 30 years ago. It bothers me that it was said that energy is the importance because that is exactly what the nuclear agencies said. We went headstrong into that before regulatory agencies and the public knew what was going on and almost killed something that might have been a good source of energy. This has happened in more recent times. We were told Freon was not toxigenic, and no one gave any thought to what happened to those particles when they went into the atmosphere. It seems like we're repeating this, we're not

changing the process in terms of adequately foreseeing. We don't even know because we don't have the science to understand how these particles react in all situations. It's not going to be your job; I think it should have been the DOE's job and the EPA's job. If the Food and Drug Administration is concerned that this is moving too fast, then I think there is really a problem there. I don't know who's in charge. Someone at the top needs to be in charge to say we are getting way ahead of the science in terms of looking at what the environmental impacts of these new compounds will be.

Hoey: I appreciate that standpoint and many of us in the ESH profession appreciate that standpoint. I'm very optimistic with what's happening from a regulatory oversight standpoint for this as a new technology. The NNI is in an opportune position to guide the research and criteria for regulation in the right direction. This is not just an issue for the United States but also one for the global community. I see an international community pushing to do the right thing. That was not seen with nuclear power.

Member Garber: In dealing with very small amounts I think it would be extremely hard to quantify things like releases or worker ingestion. A suggestion could be to irradiate the nanomaterials in small amounts to allow for the detection of materials that escaped.

Hoey: The consultants had discussed some similar ideas. (Inaudible)... the sciences, it was interesting to note that once they injected radio traced nanoparticles into these animals they could immediately see the dispersion within the body. Given that it is a radioisotope it can be easily detected. That is certainly a measurement of the technology. I want to mention when I spoke of that four percent, it did not include the ongoing research in measurement technology, which is a separate category under NNI. I think what you will see is a growth of new technology, apparatus and processes to measure this new material.

Member Jordan Sweet: Is NNI only guiding research or will it actually be setting regulations and policies? If it is doing that, is it to oversee research in academia, industry, government labs and also commercial production?

Hoey: All of the above. There are 25 federal agencies in the NNI. There are about 15 that have budgets for nanotechnology-related research. All the big players in regulatory development are involved, like NIOSH and the EPA. The second document on the last page of my presentation is a roadmap of who's who with respect to nano research. If this group is interested in that type of information, it could be an entire evening of discussion.

Member Jordan Sweet: Will there be a coherent set of guidelines that everyone has to follow?

Hoey: That is my hope. What I'd like to see come out of these initiatives is a set of standards that are going to cover work safety and health. NIOSH, OSHA, and organizations like the National Institute of Science will come up with the mechanisms for measurement of the standards. Then there will be the other side like the EPA that will regulate environmental releases. The key will be how the two major bodies work together to make sure there are no gaps. I think because of the NNI there is the potential to do that. Without the NNI, I don't think you would see that.

Member Shea: Is the Agency for Toxic Substances and Disease Registry (ASTDR) part of the NNI?

Hoey: I believe they are. If you'd like to stay after I could confirm that for you.

Member Shea: I would like to have a whole meeting on these different agencies, who's involved.

Hoey: There is a ton of information. We would be happy to get that to you.

Member Shea: I go along with some of the other comments. I have no confidence in the EPA based on past experience. Who's in charge of liability? How much money is going to be set aside for liability?

Hoey: I just read a report by the Swiss Research Institute, which was commissioned by the Swiss Insurance Agency. They spoke of liability; who is going to pay for what and how to insure for new technologies when the hazards are not yet understood. One of the interesting points in the report is when you build and engineer atomic materials there are fingerprints on them that make it easier to determine the origin. There is a signature to these things. If a pollution event does ever occur it might be very easy to trace it back.

Member Shea: The nuclear industry has a special deal to cover liability. Is that going to happen with nanotechnology?

Hoey: I don't know, that is probably a function of the standards and how strict they will be.

Copies of the SBMS Interim Procedure "Approach to Nanomaterial ESH" that Steve Hoey had mentioned during his presentation were available.

10. Agenda Setting

Jeanne mentioned the next meeting was scheduled the evening prior to Veteran's Day and asked if the meeting should be changed. The group agreed to keep the planned meeting date for November 9. Jeanne asked if the CAC was still interested in speaking with the regulators from the Suffolk County Department of Health Services (SCDHS), Environmental Protection Agency and the Department of Conservation. The CAC concurred. Jeanne said she would arrange that for the next meeting.

November 9 Agenda

Discussion of PRAP for g-2

Meeting adjourned 9:49 p.m.

2006	Affiliation		First Name	Last Name	JAN	FEB	MAR	APR	No Mtg MAY	JUN	JUL	No Mtg. AUG	SEP	OCT	NOV	DEC
Chart Key - P = Present																
ABCO	(Garber added on 4/10/02)	Member	Don	Garber	P	P	P	P		P	P			P		
ABCO		Alternate	Doug	Dittko												
Brookhaven Retired Employees Association		Member	Graham	Campbell		P	P	P		P	P		P			
Brookhaven Retired Employees Association (L. Jacobson new alternate as of 4/99)(A. Peskin 5/04)		Alternate	Arnie	Peskin		P				P				P		
CHEC (Community Health & Environment Coalition (added 10/04)		Member	Sarah	Anker	P		P			P	P		P			
			Ann Marie	Reed										P		
Citizens Campaign for the Environment		Member	Adrienne	Esposito	P			P		P	P		P	P		
Citizens Campaign for the Environment (Ottney added 4/02-takenoff 1/05 Mahoney put on)(7/06 add Kasey Jacobs)		Alternate	Kasey	Jacobs	P	P					P					
E. Yaphank Civic Association		Member	Michael	Giacomaro	P	P	P				P		P	P		
E. Yaphank Civic Association (J. Minasi new alternate as of 3/99) (M. Triber 11/05) (Munson 6/06)		Alternate	Brian	Munson						P						
Educator		Member	Audrey	Capozzi												
Educator (B. Martin - 9/01)		Alternate	Bruce	Martin						P	P					
Educator (A. Martin new alternate 2/00) (Adam to college 8/01)(add. alternate 9/02)		Alternate	Adam	Martin							P					
Environmental Economic Roundtable (Berger resigned, Proios became member 1/01)		Member	George	Proios	P			P		P				P		
Environmental Economic Roundtable (3/99, L. Snead changed to be alternate for EDF)		Alternate	None	None												
Fire Rescue and Emergency Services		Member	Joe	Williams												
Fire Rescue and Emergency Services		Alternate	Don	Lynch						P	P		P	P		
Fire Rescue and Emergency Services		Alternate	James	McLoughlin		P										
Friends of Brookhaven (E.Kaplan changed to become member 7/1/01)		Member	Ed	Kaplan	P		P				P		P	P		
Friends of Brookhaven (E.Kaplan changed to become member 7/1/01)(Schwartz added 11/18/02)		Alternate	Steve	Schwartz			P	P		P			P			
Health Care		Member	Jane	Corrarino	P		P	P			P					
Health Care		Alternate														
Huntington Breast Cancer Coalition		Member	Mary Joan	Shea	P		P	P					P	P		
Huntington Breast Cancer Coalition		Alternate	Scott	Carlin												

2006	Affiliation	First Name	Last Name	JAN	FEB	MAR	APR	No Mtg MAY	JUN	JUL	No Mtg. AUG	SEP	OCT	NOV	DEC
	Intl. Brotherhood of Electrical Workers/Local 2230	Member	Mark Walker	P	P	P	P		P	P		P			
	IBEW/Local 2230	Alternate	Philip Pizzo												
	L.I. Pine Barrens Society	Member	Richard Amper												
	L.I. Pine Barrens Society (added P. Loris 6/05)	Alternates	Elina Alayeva			P	P		P	P		P	P		
	L.I. Progressive Coalition	Member	David Sprintzen	P	P	P	P		P	P		P	P		
	L.I. Progressive Coalition	Alternate	None None												
	Lake Panamoka Civic Association (Biss as of 4/02)	Member	Rita Biss	P	P	P			P	P		P	P		
	Lake Panamoka Civic Association (Rita Biss new alternate as of 3/99)	Alternate	Joe Gibbons												
	Long Island Association (Groneman replace 10/05)	Member	Lauren Hill	P					P	P					
	Long Island Association	Alternate	William Evanzia		P	P	P		P			P			
	Longwood Alliance	Member	Tom Talbot	P	P		P		P						
	Longwood Alliance	Alternate	Kevin Crowley												
	Longwood Central School Dist. (switched 11/02)	Member	Barbara Henigin	P	P	P	P		P	P		P			
	Longwood Central School Dist.	Alternate	Allan Gerstenlauer												
	NEAR	Member	Jean Mannhaupt				P		P			P			
	NEAR (prospect taken off 3/4)(Blumer added 10/04	Alternate	Liz Bowman									P			
	NSLS User	Member	Jean Jordan-Sweet	P	P	P	P			P		P	P		
	NSLS User	Alternate	Peter Stephens												
	Peconic River Sportsmen's Club (added 4/8/04)	Member	John Hall	P		P	P		P			P			
	Peconic River Sportsmen's Club	Alternate	Jeff Schneider												
	Ridge Civic Association	Member	Pat Henagan	P	P	P	P			P		P	P		
	Science & Technology (added 1/13/05)	Member	Iqbal Chaudhry		P	P	P		P	P		P			
	Town of Brookhaven (Graves made member 6/06)	Member	Anthony Graves	P			P			P		P	P		
	Town of Brookhaven	Alternate	None None												
	Town of Brookhaven, Senior Citizens	Member	James Heil	P	P	P				P		P	P		
	Town of Brookhaven, Senior Citizens (open slot as of 4/99)	Alternate	None None												
	Town of Riverhead	Member	Robert Conklin	P	P	P	P		P	P		P	P		
	Town of Riverhead (K. Skinner alternate as of 4/99)	Alternate	Kim Skinner												
	Wading River Civic Association	Member	Helga Guthy	P	P	P	P			P		P	P		
	Wading River Civic Association	Alternate	Sid Bail						P						